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ABSTRACT

The role of information technology (IT) is changing, and is becoming more important for the overall success of colleges today. The structure of IT has not changed much through the years, but a greater amount of institutions exist where multiple areas of technology are being merged back into a single IT organization. The model of IT explored in this paper has the three major components of hardware, software, and personnel. These basic resources are the core of IT, with communication as the gravity that holds everything together and enables all functionality. Communication technology is growing rapidly, and is the largest contributor to the changes in IT. Surrounding the trio of resources are the structural layers of organization, management, planning, policy, and procedure. The internal and external forces that are always trying to alter or deteriorate the structure which keeps IT operational, efficient, and self-sufficient complete this IT paradigm. Some of these forces are: executive management; innovations in hardware/software/communication, government and other intervention, user demand; obsolescence; and image and attitudes. Insight is provided into each of these components of IT. It is concluded that the most important factor is the acceptance by the entire college community of IT as a group of professionals devoted to the technological health of the whole institution. It is the IT organization's responsibility to be as knowledgeable as possible about current technologies, demonstrate an image of professionalism, and encourage the use of technology as the most important tool for faculty, staff, and students. (Contains seven references.) (MAS)

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Organizational Leadership through Information Technology

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The very idea of Information Technology staff leading an institution of higher learning is probably very frightening to executive level management of colleges and universities. But as solutions to the multitude of crises are determined, it is becoming clearer that the role of Information Technology is changing rapidly and is becoming more important for the overall success of colleges today. I am not talking about power or control within an institution, but the empowering of IT professionals to advise, plan, and coordinate technical development on our campuses. There is probably some reluctance for executives of colleges to accept their "techie" counterparts as acceptable sources of information, advice, and know-how to solve many of the problems, challenges, and opportunities that reside at many colleges. For once in the lives of computer professionals they are able to take the initiative to climb their way into the once-improbable positions of higher level management and are afforded a view of the "whole picture" even though their normal habitat is in the basement with no windows.

The structure of Information Technology has not changed that much through the years, but we are experiencing a greater amount of institutions where multiple areas of technology are being merged back into a single IT organization. The simple model of Information Technology that I envision has the three major components of hardware, software, and personnel. These basic resources are the core of IT with communication as the gravity that holds everything together and enables all functionality. Communication technology is growing at an alarming rate and is the largest contributor to the changes in Information Technology. Surrounding the trio of resources with their "gravitational pull" of communication, are the structural layers of organization, management, planning, policy, and procedure. To complete my IT paradigm are the internal and external forces that are always trying to alter or deteriorate the structure that keeps IT operational, efficient, and self-sufficient. Some of these forces are:

- executive management
- innovations in hardware/software/communication - government and other external intervention - user demand
- obsolescence
- image and attitudes

Obviously, I cannot adequately cover these topics extensively in this paper, but my aim is to provide some insight into each component.

Hardware/Software/Personnel

There is a substantial amount written about the changes in hardware and software. I feel that most of this can be summarized as hardware getting cheaper and software more expensive. Every year hardware

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capacity and speed grow exponentially, while software systems become more function-rich and complex. Productivity has improved immensely, while the productivity of technical staff has been hampered. Without adequate training programs, technical staff are becoming obsolete faster than the software and hardware they utilize. The traditional emphasis when a deficiency of resources has been detected has always been to purchase hardware and software with little attention being paid to the human resources necessary for adequate support, maintenance and operation. We may still need to purchase the technology, but we must acknowledge the additional burden this places on existing staff. I believe the foundation of this problem lies in the continued belief in the myth that you c! an replace staff by purchasing more computing resources. This certainly doesn't appear to be true, now or yesterday.

Although the technical staff writes less computer code, they are spending much more time evaluating hardware and software solutions and modifying how end-users interface and use their technical resources. We have become enablers and facilitators rather than programmers and operators. We no longer compute, we provide organization of information and act as liaisons between hardware software systems and the end-users. All the advancement of leading-edge technology is worthless if you do not have well-trained personnel for design, operation, and support. Technology training is the biggest irony in higher education. Our primary product is educating students, so why is it so difficult for college management to see that training technology staff is one of the weaknesses in the advancement of technology on their campus? It only seems reasonable to me that as IT gets more complex, less manageable, and more integrated with other forms of technology, that personnel will need training that the institution can't provide for itself.

Communications

The area of communications is probably the largest factor that is driving development of technology on our college campuses. Communications techniques are improving at a much faster rate than any other form of information technology and costs are decreasing as rapidly as new services are being developed. As in computing, software is gradually catching up to hardware. But as communication methods are developed it is becoming clearer that acquisition and ownership of large communication systems will not be necessary, most capabilities will be available through networking and service offerings from multiple vendors. There will be much more emphasis placed on infrastructure to provide access, since it is no longer an issue of computing but more about access and connectivity. I feel that communication techniques are being developed at a faster rate than information technologists can develop applications to utilize them. Connectivity issues are far from resolved and standardized, but network users are more concerned about the speed of communication than any other aspect.

With the communications revolution, we have developed a whole new set of challenges and opportunities. We are able to connect users that have never been able to communicate electronically with each other, on and off campus. This connection is the root of the importance of technology in higher education. With networks, facsimile, telephony, video, and information affordable and available on every desktop, you can begin to see how these integrated functions will likely alter the way colleges do business. Bandwidth is being provided in many forms. Much attention is given to Category 5 wire, fiber optics, T-spans, and wireless, to name a few. Whatever you install, you can't be confident that it

will last 20 years like the original cable plants that only had to facilitate voice communications. It appears that many of the latest developments will provide the capacity and speed required for the next five to eight years, but it is impossible to guess beyond 10 years from now. The communications infrastructure on most campuses has not nearly kept pace with the demands placed on it. A failing or deficient infrastructure is usually the most ignored aspect of technology development (until it is too late) and progress is delayed significantly. It is obvious that you never install cable with the needs of only the next few years in mind. You must install multiple types of cable mediums and in quantities twice to ten times what you feel will be necessary in the next 5 to 10 years. In addition, you must look for ways of improving the infrastructure without expensive installation costs. By laying additional conduit in trenches, making additional openings in building foundations; and allowing for more space in wiring closets on each floor with excessive bandwidth between floors, we can eliminate or at lease minimize re-cabling costs for future years. There is a new awareness around campus these days. Information that is not shared is worthless. Collaboration has already become a vital need in everyday operation at all levels in a college community.

Organization and Management

Now we start working on the outer layers of my IT model, that provide the substance and cohesion of the primary resources involved. The actual position of the IT group(s) in the institutional organization chart indicates what position the IT component actually plays in decisions of campus-wide importance (like technology). If there are many levels of management above IT, there is likely to be a more reactionary role rather than proactive. There is a great need for IT professionals and executive management to create a partnership that will direct the institution into informed decisions regarding the future of technology on their campus. This may require restructuring of the organization to eliminate middle-management between these technical and executive levels. Also it will be much easier to adjust the strategic position of the IT if it has centralized management and appears as a single entity, even though the various functions are decentralized (administrative computing, academic computing, networking, library resources, telecommunications, and video communications).

Many institutions have gone as far as having a single executive level position act as the Chief Information Officer (CIO) of the institution. As long as executive management recognizes the authority of this CIO, it would substantially increase the influence of IT on overall technical development in the institution. The advantage is that a single person can easily represent and project a common vision and consistent leadership for effective management of IT. I don't feel that this position is required for an institution to progress and compete in the technical arena, but it would be much simpler to implement and more effective leadership than alternatives. One alternative or interim step to this type of IT leadership would be to establish a single committee of executive management and IT professionals from all technical entities on campus. This would at least provide a forum for ongoing dialog, brainstorming, and formal planning. While the leadership must be centralized for effectiveness and to insure a common vision and mission, the actual areas that comprise IT do not necessarily need to be physically located in one area (although it helps). The individual resources may be distributed throughout the campus for convenience, efficiency, or necessity. With networking capabilities the physical locations of resources become secondary. The primary goal is to decentralize information systems, while centralizing the planning and management functions.

Policies and Planning

An integral part of the organizational structure of IT is the policies and planning that provide the rules and the road map to progress and hopefully to success. The planning and policies that have been developed on a campus are indicative of the progress that has been made and that will be made in the future. Unless there are policies in place, you will have little control over use and abuse of technology resources and if you have no formalized planning you will probably need to react to every situation that arises. An end result of improper or non-existent planning is that you are never prepared to defend a request, predict technology directions, compete for funding or represent the current situation. A good start for effective planning and policy-making is to be aware of the mission of the entire institution and to formulate a related mission statement for Information Technology. These will provide the benchmark that you need to evaluate every plan and policy in the future. Each document you prepare should complement and support both missions and definitely not contradict in any way. Any planning should directly relate to your overall vision of the future of IT at the institution and policies should not restrict access and creativity of users unless it is absolutely necessary. Some of the polices and plans that determine technology use and direction are:

- PC hardware/software replacement plans - hardware/software purchase policies for faculty, staff, and students
- disaster recovery plan (link with campus-wide plan) - strategic plan (link with campus-wide plan)
- copyright and distribution policy (including virus control and software duplication)
- ethical use of IT policy (including use of internet, e-mail use, security, authorized access, privacy, limitations of use, risks, legality, and backup/retention)
- PC ownership policies (access, services) - access policies for disabled users (faculty, staff, and students

This is not intended to be an all-inclusive list, but just enough to leave you with some ideas. Whatever the policy, it should be driven by the needs of the institution and not by political or private reasons.

In truth, the IT revolution has begun on our campuses and most institutions can't afford to ignore it or suppress it, they can only learn to plan for, design, and regulate the advancement. By regulation I am not implying limitation, but attention to current needs, technology alternatives, and desired growth. Unplanned growth is not going to be advantageous toward success, since direction and control aspects are necessary. Haphazard development may appear all right on the surface, but may cause many other more serious problems at a later point. Peter Senge points out in The Fifth Discipline that "today's problems come from yesterday's solutions." Institutions should resist the temptation of planning totally by financial limitation and percentage increases in operating budget for IT. IT planning should be a need-based long-range technology transition strategy with a single attainable vision derived from the partnership of executive management and IT professionals.

Image and Attitudes

Along with the campus library and athletic programs, technology is sometimes thought of as a "black-hole" for financial resources, where money disappears in larger quantities every year and no physical return is always realized. I really don't understand this attitude, but I suppose the reason that it exists lies in the assessment of results. Even if you can touch it and see it, what does it really do for the institution? Many benefits of success in technological advancement are intangibles and can't be easily measured (morale, innovation, flexibility, diversity, community). Maybe the reason for this image is the misrepresentation of IT by computer professionals that made all kinds of promises that were never kept. Whatever the reason, it still exists. The increased requirements for accountability should gradually change this image over time. Another impression that seems to be prevalent on most campuses is the image of IT being a "service bureau" that performs functions only when requested to do so. In the past IT has been limited to the scope of the requests and the resources we could muster to resolve most of that demand. It has been difficult for IT to climb out of this rut. We do not intend on deserting our customers and downsizing our service level, but we must change the image that we only respond to commands. The creativity of design, the knowledge of integrating various technologies, and the vision to progress as a team of professionals overwhelmingly requires that we join the executive management of our institutions in planning how we will thrive in the future through the development of technology. It is time that IT is realized as much more than number- crunchers. We now provide leadership with information and the organization of that information which develops into knowledge. In the accountant's view we become less of a liability and more of an asset to the institution. The only way to dispel some of the stereotypes and attitudes toward IT professionals, we must continuously take the offensive and demonstrate to management that IT is an essential component to the achievement of short and long range goals of the institution and that by our direct involvement, their roles are simplified and not threatened. The value of IT and the perceived value can only be demonstrated by showing what functions on campus would be impossible if it were not for technical developments. The advance of technology will enable colleges to survive and even flourish in a time of competition, reorganization and strategy. The partnership between IT and management will be the strongest weapon against obsolescence and elimination in the world of technology.

Executive Management and Financial Issues

Most of the issues involved between IT and institutional executives have been dealt with in some way in previous sections, except for financial limitations, the root of most differences. It is no surprise that funds for IT development compete with many other essential areas for priority (salaries, library, physical plant, and financial aid). This is notably a very difficult task for the executives of a college to pick and choose where funds will be allocated. We are way beyond the point of realizing that the operating budget is not going to supply the amount of financial resources it will take to maintain current levels of technology let alone all the funding that will be necessary to gradually advance. The only other creative financing is to either borrow money or seek grants and gifts specifically directed toward technology development. In order to successfully receive grants, you must research for donors that are a good match and have a vested interest in your success. You must demonstrate to the donor that you will be successful and you must be able to project the vision as an attainable goal that you have engineered

to achieve nothing but success. Regardless of how funds are obtained, when you receive the funds necessary for a project, you must already be prepared to be working on the funding for the next project.

Technology Innovations

I don't really want to get technical in this area, but I would like to mention some of the latest innovations and the probable effect they may have on IT in general. I have listed some of the areas below: - storage systems (RAID, video disk, optical disk, CD-ROM) - cable systems (cat 5, fiber, wireless) - telecommunications and networking (fast Ethernet, ATM, wireless, video conferencing, cellular, ISDN, frame relay, client/server)

- peripherals (imaging, VRU and speech recognition, universal ID cards, optical readers)

- application methods (data warehousing, object oriented programming, image databases, EDI, CASE tools, GUI, EIS) Many of these are not even new technologies, but have not had widespread acceptance and are experiencing some interest as other factors develop.

These external influences can become a real problem to the most informed technology manager, because it seems our users know about new developments before we have a chance to explore them. Faculty, staff, and students are arriving on our campuses with more technical expertise and naturally have a much higher expectation of institutional technology resources and access to them. This really puts pressure on an under-staffed IT department. Networking technologies, alone, have changed the whole culture of the college campus by connecting faculty, staff, and students that you would have never envisioned as meeting each other, let alone exchanging e-mail and data files. Networking has opened up the whole area of security, privacy, and information access. And as most managers have already experienced, networks are far-reaching, costly, and unavoidable. In dealing with new technology, it is most important to be sure that the services and connections are available at your location to facilitate what you wish to do. With the convergence of computing, storage, and communication, it is not always possible to have the three technologies coexist, since these areas are all emerging at different paces. Although the future still appears to be digital in nature, our local voice and data service providers have not reached our level of technology. We will, however, be seeing great strides in the area of communication with the CTI technology being pushed by application demand. A few years ago, all we heard about was how we would become a paperless society. Well, I'm still waiting for this to happen, because my paper budget grows larger every year. Imaging technology coupled with storage systems development seems to be the answer for the future, but we must be patient. IT managers can only read technical journals and attend trade shows to learn about what technology is available and whether it would apply to the overall vision for technology on their campus. Listening to vendors (instead of avoiding them), is also an available source for learning about new equipment and techniques. College campuses need to share new ways of doing things with each other by visiting other campuses. If management takes the time to ask your opinion or include you in planning sessions, you must know what is available and what it will cost your institution. You must be prepared to defend or deny new technologies when requested and users making the requests should be able to explain why they require the new technology.

Government Influence

There might be other external influences, but the government is undoubtedly the largest. Each year we get more changes in reporting rules in almost every facet of computing. Some of the most demanding changes have taken place in the area of financial aid reporting. We have seen financial aid software become one of the largest and most complex subsystems in our administrative software systems. Our recruiting process for new students has become extremely competitive with other institutions solely because of stringent information requirements by the government. Now the newest governmental change is in the area of fund raising, in the form of FASB 116 and 117. These two rules deal with accounting for contributions received and financial statements of not-for-profit organizations, respectively. This changes the way we record gifts and how they are to appear on computer prepared financial statements. This has the attention of most accountants and auditors, with most IT staff nervously trying to obtain timely information to make software adjustments by the time results are expected. Another government entity has also played a threatening role to computing stability, that would be the US Postal Service. I say threatening, because we have been warned of impending requirements for all bulk mailings. For at least 5 years, we have been expecting "zip plus four" and bar-coding to be mandatory for all our bulk mail. Although this has not materialized we have planned to alter our databases to match possible specifications, while investigating PC-based systems for continuous update of zip+4 address information via CD-ROM and bar-code printing devices for out-going envelopes. Proper preparation for external influences is more important than the changes themselves. Probably the most widespread influence on technology on college campuses will be whatever the government decides to do with the existing internet and the National Information Infrastructure. Whatever state, local, and federal network infrastructures are built will determine what role communications will play in our overall connection to the rest of the world and how much it will cost individual institutions.

User Demand

It is obvious that as more faculty, staff, and students are connected to campus networks, there are greater numbers of users making demands on the IT staff. Most times the growth of that staff has not kept pace with the growing customer base. One of the grim realities of IT is that demand always runs way ahead of supply. Not only is the demand increased, but the level of support has become more complex with the higher expectations of users with more training than the staff that supports them. To our users it is no longer acceptable to say "we don't know how" and "we can't do it" they expect us to build whatever is requested. In many cases, we have started using a team approach involving end-users in the planning, design, and implementation phases of system development. This assists IT when there is a shortage of staffing and also allows the end-users to learn their applications from the ground-up and they don't require much in additional training. We have also shifted the "ownership" of data to our customer base and made them responsible for distribution of information from our institutional database. This relieves the IT staff of some of the burden of reporting and data query, allowing us to become designers and directors rather than data processors. Much of the user demand has shifted from application development to general resource and information access. Accessibility is not limited to on-campus resources and their is increasing demand for non-institutional access and sharing of

information and communication. With the advent of the new technological college library there has been much more interest in material access, searching, indexing, and retrieval of data, text, and images.

The most requested access by any user group on campus has been for internet access, for a multitude of reasons. I don't expect this demand to decline in the near future. As IT professionals, our biggest concerns besides physical connections for this access, is the controlling and limitation of access for security and privacy concerns. Separating ownership from access of data has been a huge industry change, but it also creates new problems with copyrights, licensing, and publishing. These issues used to be someone else's problem...now they are probably your problems. The solutions that you develop will probably change the way you look at information technology and how your users view technology and you.

Obsolescence

The aging of systems is a force that exists and there is little we can do with the issue, but acknowledge that it is an issue. We typically lease our hardware, software, and maintenance contracts for a fixed length of time, which forces a decision at the end of the lease period. Another approach is to have a fund that is accumulated throughout the expected lifetime of your current configuration, so the financial resources are available when it is time to convert to new technology. You must exercise extreme caution when acquiring hardware and software to insure that any promises you make to management and your users you can keep. A less traditional issue related to aging systems is that technical staff becomes obsolete faster than the equipment. This can be solved with consistent and extensive training programs. In most cases what the technical staff knows is worth more than the information they administer, making this another major asset of the institution. This asset, like any other, needs continued maintenance and support.

Conclusion

There are many other internal and external forces that continually challenge the organizational structure of IT, but these will continue to change and accumulate while the management of IT will continue to find solutions to each situation. The important factor here is the acceptance by the entire college community of IT as a group of professionals devoted to the technological health of the whole institution. It is our responsibility to be as knowledgeable about current technologies, demonstrate an image of professionalism, and encourage the use of technology as the most important tool for faculty, staff, and students. With increased complexities, increased costs of administration, scarcity of funds, deteriorating facilities, increased competition, and growth in government intervention, IT professionals must show that they can be relied on for leadership and solutions.

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